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# The Manufacture of Cottage Cheese in Iowa Creameries and Milk Plant

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April, 1931

Circular No. 126

# **The Manufacture of Cottage Cheese in Iowa Creameries and Milk Plants**

**By E. F. Goss and Glenwood Mutton**

**AGRICULTURAL EXPERIMENT STATION  
IOWA STATE COLLEGE OF AGRICULTURE AND  
MECHANIC ARTS**

**C. F. Curtiss, Director**

**DAIRY INDUSTRY SECTION**



**AMES, IOWA**

## **SUMMARY**

That there is a greatly increased demand for cottage cheese is evidenced by an increase in cottage cheese manufactured in the United States from less than 30 million pounds in 1919 to over 87 million in 1928.

The following is a brief summary of the more important steps in a successful method of cottage cheese manufacture.

Fresh, clean flavored skimmilk is pasteurized at 142-143° F. for 30 minutes.

After cooling to 90° F., 5 percent of good culture is thoroly stirred into the milk.

The curd is cut into cubes with wire curd knives as soon as a firm jelly-like curd has formed.

After 20 or 30 minutes, hot (170° F.) water is added to the vat to bring the temperature to 120° F. in one to two hours with only sufficient stirring to secure uniform temperature and prevent matting.

When curd is firm the whey is gradually replaced with cold water, cooling the curd and freeing it from all traces of whey.

When the curd is below 60° F. and has drained fairly dry, salt is added at the rate of 1 percent of curd. This will be about 2½ ounces per 100 pounds of skimmilk.

Fresh pasteurized cream is added at the rate of one pound of cream to each four pounds of cheese.

Single service containers of 12-ounce capacity furnish a superior method of packaging cottage cheese.

Cottage cheese can usually be sold at a good margin of profit over the cost of manufacture.

In marketing cottage cheese, the attention of the consumer should be constantly called to its high food value and the many ways in which it can be utilized.

Success in the manufacture and sale of cottage cheese is dependent upon the ability to produce cheese of outstanding quality. This is not difficult but requires care and close attention to the requisite details.

## **The Manufacture of Cottage Cheese in Iowa Creameries and Milk Plants**

By E. F. Goss and Glenwood Mutton

For several years the Iowa Agricultural Experiment Station has been interested in promoting the manufacture of varieties of cheese which promise a satisfactory return under Iowa conditions. Cottage cheese is one such type.

Recently the demand for this type of cheese has increased greatly. The Bureau of Markets and Crop Estimates officially reports 29,785,329 pounds of cottage pot and bakers' cheese manufactured in the United States in 1919. By 1926 67,977,000 pounds were manufactured, an increase of 128 percent. In 1928, the amount manufactured was 87,525,000, a further increase of 65.3 percent over the production of 1919.

Dairy plants in Iowa have not yet fully appreciated the possibilities in the manufacture of high quality cottage cheese. The Bureau of Agricultural Economics reports that Iowa dairy plants manufactured 645,000 pounds of cottage cheese in 1928 while California manufactured 17,103,000 pounds. Iowa manufactured only 0.26 pound per person while California manufactured 3.75 pounds per capita or more than 14 times the Iowa production.

The unusual demand for cottage cheese has accompanied a change which has been taking place in the dietary habits of our people. A recent survey by J. O. Dahl, associate editor, *Hotel Management*, reports the following for 614 hotels and 790 restaurants. Since 1917 sandwich trade has increased 215 percent; salads 110 percent; fresh vegetables 35 percent and fresh fruits 39 percent. This has been accompanied by a 45 percent decrease in meat orders. The great value of cottage cheese as an inexpensive source of high quality animal protein has been recognized, and greatly increased opportunities for the manufacturer are the result.

The Iowa Agricultural Experiment Station, appreciating that Iowa dairy plants can make the most of the opportunities in cottage cheese only if a practical method for producing the highest quality cheese is available, has worked out the system of manufacture outlined in this circular. The methods described are now in daily use in the college dairy, on a commercial scale, and have proved their worth.

The increased manufacture and use of cottage cheese in Iowa de-



depends largely upon the quality of cheese produced. Cottage cheese has been considered so easy to make and so much of a side line that it has not received the attention it deserves, with the result that the quality of cheese has often suffered. Altho cottage cheese does not require elaborate equipment and the process is not difficult, satisfactory results cannot be secured unless the proper equipment is available and close attention is paid to the details of the process.

### Where Cottage Cheese Can Be Made

Wherever a supply of fresh, high quality skim milk is available in city milk plant, or creamery, cottage cheese manufacture is possible. A poor quality skim milk will make inferior quality cheese and the response of the buying public to such a product will probably not warrant its manufacture.

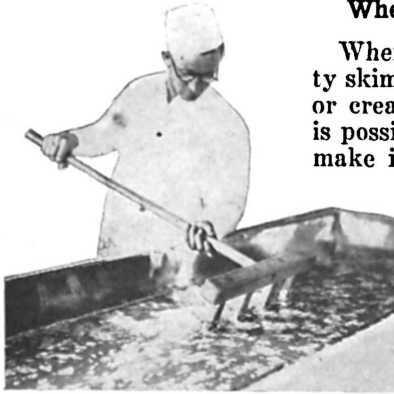


Fig. 1. The temperature of the milk is adjusted to 90° F.

### Equipment Needed

It is assumed that pasteurization equipment is already available. The usual vat pasteurizer used in milk plants and creameries is suitable. A channel bottom cheese vat with

decided slope is needed. The size can be estimated from the amount of cheese to be made. About 100 pounds of skim milk is needed for each 16 pounds of curd. A vat 25 to 50 percent oversize should be obtained to allow for an increase in make and the addition of water to the curd during cooking. With this vat there should be a vat strainer for use in removing the whey and water. An agitator for stirring the milk in the vat and later stirring the curd in the whey should be included. The agitator shown in fig. 1 is satisfactory. A flat board 8 inches wide and 4 feet long narrowed to a 2-foot handle will answer very well and does not break the curd greatly. The usual cheese curd rake is not suited to this work since it breaks the curd too much. The wire curd knives should be strung with wires at least  $\frac{3}{8}$  inch apart, altho  $\frac{1}{2}$  or  $\frac{5}{8}$  inch will produce a curd with larger flakes if this is desired. An accurate floating dairy thermometer is necessary. An acid test outfit will often be found helpful (see fig. 2). Milk plants usually have equipment for cultures for commercial buttermilk, and creameries have facilities for culture making for butter; therefore no additional equipment of that sort should be needed.

The cost of cottage cheese equipment for 300 pounds of cottage cheese per day is listed. These prices were taken from the current price list of a creamery supply house.

1 300-gallon vat with strainer.....	\$180.00
1 pair curd knives.....	10.00
1 curd agitator.....	3.00
1 floating thermometer (accurate to 1° F.).....	1.00
1 curd scoop.....	3.25
1 acid test outfit.....	5.20
2 aluminum paddles.....	1.00
1 1-gallon strainer pail.....	1.75
1 muslin or duck vat cover.....	7.00
<b>Total .....</b>	<b>\$212.20</b>

### Pasteurization of the Skimmilk

Pasteurization of skimmilk is necessary for the best quality of cottage cheese. The process described in this publication is for pasteurized milk. To pasteurize, the usual holding method as practiced in market milk plants, consisting of heating to 142 to 143° F. for 30 minutes, is satisfactory. Higher temperatures have been used, but the effect upon the body and texture of the cheese are detrimental, and the higher temperatures are in general not necessary. A higher temperature is needed in case the germicidal property of the milk seriously interferes with coagulation. A case of this kind occurred in the college plant for a few days during February and again in April, 1929. About the time of the first period, an instance of failure of the cottage cheese milk to coagulate with normal pasteurization temperatures, was reported from a nearby plant. In these instances with the normal pasteurization temperatures of 142-143° F. for 30 minutes and with an active starter, coagulation did not take place in 24 hours. The resulting curd at the end of the coagulation period was, of course, poor both in flavor and texture. Increase of the pasteurizing temperature to 165° F. was sufficient to enable coagulation to take place within a normal period of time. The curd from the high pasteurization temperature milk, however, was friable upon coagulation, was easily broken too finely after cutting and retained too much moisture. A temperature of 155° F. produces a fair curd, but the texture of the cheese and the working properties of the curd are much inferior to the 142-143° F. pasteurization results. With the straight acid method of coagulation, it seems impossible to produce a satisfactory curd and high quality cheese when high pasteurization temperatures are used.

The following table shows the effect of pasteurizing temperatures upon the development of acidity and coagulation in the case of mixed milk with consid-



Fig. 2. Testing for acidity aids in controlling the process.

EFFECT OF GERMICIDAL PROPERTY UPON RATE OF ACID DEVELOPMENTS

Time	Raw	142°F.	150°F.	155°F.	160°F.	165°F.	180°F.
10 a.m.	.185	.185	.185	.18	.18	.185	.18
11 a.m.	.205	.195	.20	.20	.20	.21	.22
12 m.	.23	.22	.215	.215	.22	.225	.25
1 p.m.	.295	.27	.27	.275	.29	.355	.35
2 p.m.	.38	.36	.36	.38	.41	.49 soft curd	.50 soft curd
3 p.m.	.5 no curd	.48 no curd	.505 no curd	.575 soft curd	.60 soft curd	.68	curd had been cut

erable germicidal property. Five percent culture was used and the milk set at 90° F.

The detrimental effects of high temperature pasteurization upon the acid type of curd do not seem to be avoided with  $\text{CaCl}_2$ , as they are to some extent when rennet coagulation is employed.

### Preparation of Cultures

Preparation of culture for cottage cheese in the creamery or milk plant does not usually involve any additional equipment or new processes. If the creamery operator can make a good butter culture or if the milk plant operator is familiar with the preparation of high quality culture or commercial buttermilk, the propagation of cultures for cottage cheese will present no new problems. No detailed description of starter making will be attempted here, since this is available from so many other sources. If desired, instructions for the preparation of culture may be obtained from the Iowa Agricultural Experiment Station. For cottage cheese a freshly curdled, rapidly coagulating culture is desired. Since a culture usually coagulates around 0.6 percent acidity the culture when used will likely be between 0.6 and 0.8 percent. If the culture is not to be used soon after coagulation

it should be cooled in order to prevent over-ripening since cottage cheese requires a fresh, active, rapidly coagulating culture. A starter with plenty of aroma is desired in order to avoid a flat cheese.

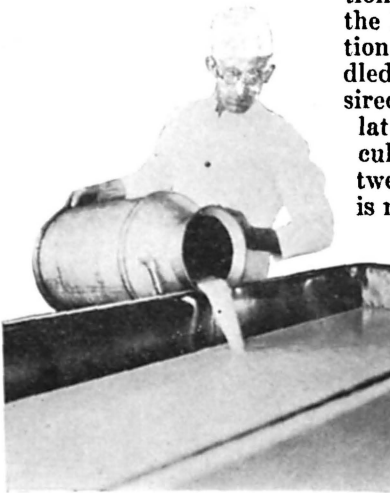


Fig. 3. Five percent culture is added.

### Setting the Milk

A satisfactory system is to cool the milk following pasteuriza-

tion to 90° F. and to add the culture immediately (see fig. 3). The two factors concerned in setting are temperature and percentage of culture. A temperature of 90° F. has several advantages over the 70-72° F. employed in making the culture. At 90° F. a curd of superior texture for cottage cheese, is secured. It is a curd which is jelly-like and does not break up readily. Further, as soon as the curd is cut it begins to shrink immediately and a clear whey layer is soon obtained with little or no stirring. The time required to bring the curd to cooking temperature is decreased and the texture of the curd is superior. Good results are secured at 80° F., but slightly more satisfactory at 90° F. Approximately 5 percent of culture has given good results, usually producing curd suitable for cutting in about 4 hours at 90° F. If only 2 percent or 3 percent culture is available, it will require a longer setting period, but if milk and culture are good, no ill effects will likely be noted. If it is desired to reduce the length of the setting period slightly, additional culture can be used. Reduction of setting time should not be attempted by raising the temperature. Ten percent of culture will give a weaker curd which shatters more easily and is therefore more difficult to handle and produces a more grainy cheese. Thoro mixing of the finely divided culture with the milk, is necessary in order to secure a curd with a firm, uniform texture. In a number of trials, both the average flavor score and the average body and texture score were slightly in favor of the 80 °F. temperature over 90° F., but the difference was insignificant and the easier handling properties of the 90° F. curd are much in its favor. Yields of curd on several lots of cheese set at 80° F. averaged 16.2 pounds curd per 100 pounds milk as compared to 15 for 90° F. curd. A firm, satisfactory curd is more easily produced from 90° F. setting temperature.

It must not be presumed that good cottage cheese will not result at a setting temperature of 70-72° F. with a small percent of culture and allowing 12-15 hours or overnight coagulation. The results, however, have not been as satisfactory as the 90° F.

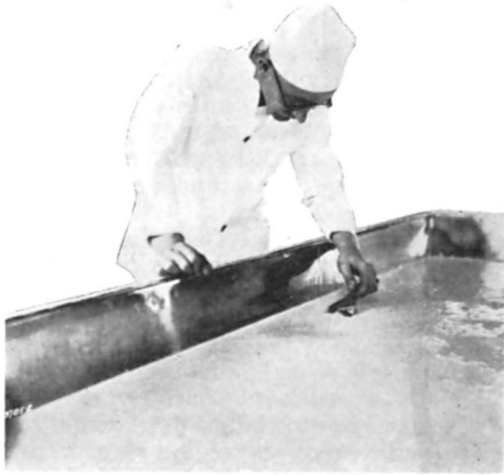


Fig. 4. The curd should split with a clean break when ready to cut.

### Cutting the Curd

If a setting temperature of 90° F. is employed and 5 percent culture added, coagulation can be expected, as mentioned above, in about four hours. The milk will at first slightly thicken, then form a soft flocculent curd and in 20 to 30 minutes after the first signs of thickening appear, there will be a soft jellylike coagulum which is ideal for cottage cheese and is the correct stage at which the curd should be cut. The curd, if left longer, will gradually become more brittle and increasingly less desirable to make cheese of the best body and texture. Such an overfirm curd will, when cut and stirred, break up readily. It does not remain in its original cubes; it tends to retain moisture and is likely to be grainy when finished.

The ideal curd for cottage cheese will break with a clean split when a spoon or paddle is used (see fig. 4). It will be soft but not flocculent. It will not be hard or brittle or break up finely. Cutting curd too early or too late is detrimental to the texture of the finished cheese and renders succeeding steps in the process more difficult.

The curd is cut in cubes with  $\frac{3}{8}$ ,  $\frac{1}{2}$  or  $\frac{5}{8}$ -inch wire curd knives (see fig. 5). First the horizontal knife is used and then the vertical knife. Standing close to the vat the horizontal knife is inserted into the curd by swinging the lower end to the bottom of the vat, while the upper portion rests against the end of the vat. When the knife is perpendicular to the bottom of the vat, it is moved to the opposite end and turned as a gate, without removing from the curd. When the curd has been cut into blankets by a sufficient number of trips lengthwise, the knife is removed by reversing the method used when inserting it. The vertical knife is inserted in one corner of the vat, a cut made across and the knife removed, breaking as little curd as possible. This is repeated until the whole vat has been cut. The same knife is then used in a similar manner to cut the entire vat of curd lengthwise. If the curd has been cut with little overlapping, it will now be found to be largely in cubes.

The uniform curd cubes thus formed cook evenly. If the curd is of the right firmness when cut and if handled properly later, these cubes will largely retain their identity during the subsequent stages of the process of making. It is not advisable to break up the curd with a rake as a substitute for cutting as many cheesemakers attempt to do. The resulting uneven sized pieces

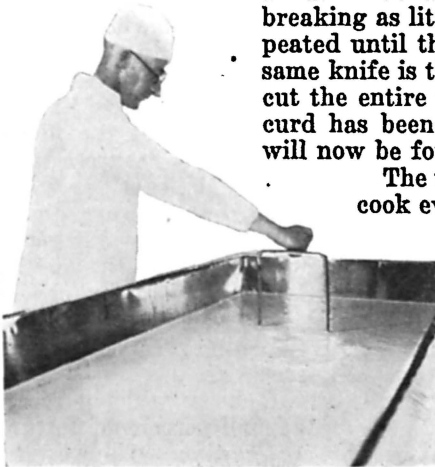


Fig. 5. The curd is cut first with the horizontal knife.

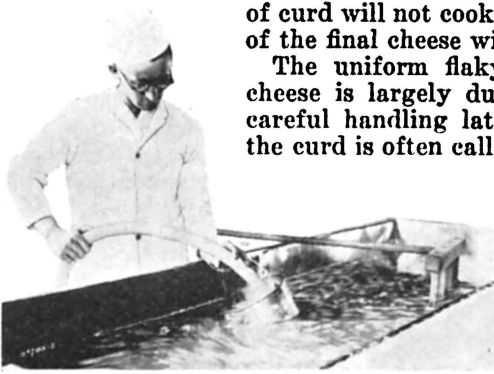


Fig. 6. Hot water (170° F.) is added to cook the curd.

of curd will not cook uniformly and the texture of the final cheese will be lumpy.

The uniform flaky texture of this sort of cheese is largely due to uniform cutting and careful handling later. From its appearance, the curd is often called cube or popcorn cheese.

Immediately after cutting, the whey will have an acidity of .45 to .50. Acidities above .55 percent frequently result in a slightly grainy, rough curd showing evidences of too high acidity.

### Cooking

If the curd has been cut at the correct firmness whey will begin to separate rapidly. No stirring is required at this time and the curd needs no attention for 20 or 30 minutes. Sometimes the curd settles to the bottom so rapidly that not any is visible at the end of this period. The curd is heated by adding to it small amounts of hot water (170° F.). (See fig. 6.) Addition of water carefully or thru a strainer pail will prevent breaking the soft curd. Heating should not be rapid, from 1 to 2 hours being required to reach the final cooking temperature of approximately 120° F. As the whey separates a part of it can be drawn off so that there is room in the vat for the addition of more water. The addition of water to the curd during cooking lowers the acidity and results in a smooth, tender curd. The cooking of the curd in the whey by means of heating with the steam jacket, may be employed, but such a curd will need to be stirred more vigorously and more frequently during heating; will probably be broken up more and will usually not have quite the smooth texture of the water cooked cheese. During the cooking process the curd should be stirred only enough to distribute the hot water added (see fig. 7). Little matting of the curd will occur if heat

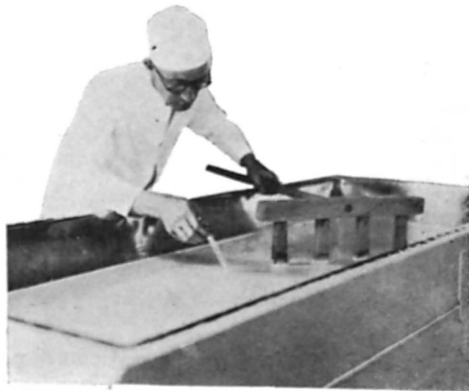


Fig. 7. The curd is stirred gently at intervals.

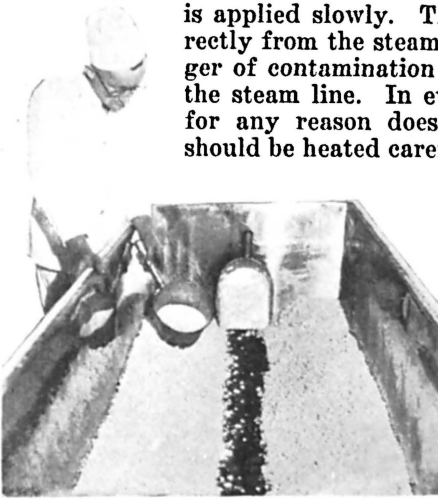


Fig. 8. One percent salt is added to the trenched curd.

is applied slowly. The hot water can be added directly from the steam hose provided there is no danger of contamination thru oil or other impurities in the steam line. In event the addition of hot water for any reason does not seem desirable the curd should be heated carefully in the whey until the curd is sufficiently firm. With this method the whey is also available for stock feeding if there is a sale for it. It has about half the feeding value of skimmilk.

### Draining the Curd

The time required to cook the curd at 120° F. is usually less than a half hour and often not more than a few minutes. A small quantity of curd placed in cold water will serve as a test for the

proper firmness and will show the properties of the curd when cooled. The curd first should be drawn well away from the gate end of the vat by means of the curd agitator. The vat strainer is inserted and the strainer pail hung over the gate. If desired the vat strainer can be dispensed with, provided the curd is drawn well away from the gate, since the small quantity of curd passing out with the whey will be caught in the strainer pail.

When the whey has been removed until the curd begins to be visible, the gate should be closed and the vat filled one-third full with cold water. It is not advisable to draw all of the whey off since the warm curd will mat. The curd seems to retain the cube form better if not cooled too rapidly. Especially if the curd was inadvertently permitted to become too acid and firm before being cut, rapid cooling will cause shattering.

A second and usually a third application of water is needed to bring the temperature of the curd close to 60° F. After the last washing, the curd should be allowed to drain fairly dry before the application of salt. The curd is trenched and piled along the sides of the vat. The firmness of the curd can be regulated by the length of time the curd is permitted to drain as drainage will usually cease when salt is applied.

### Salting

The salt is added at the rate of 1 pound for each 100 pounds of curd (see fig. 8). If the cheese process is controlled so that uniform yields are secured, the quantity of curd is estimated at 15 to 16 pounds

curd per 100 pounds of skimmilk used and this will be sufficiently accurate for both salting and creaming. If the above salting rate should seem a little high, it might be reduced to  $\frac{3}{4}$  percent. About half the salt is sprinkled over the curd, using a seive or strainer dipper and, after the curd has been turned, the remaining half is added. Cream should not be added until salt is dissolved and the curd appears dry.

### Creaming

The sale for uncreamed cottage cheese is rather limited when distributing thru retail channels and, in general, is proving successful only to a special trade. The creamed cottage cheese does not, of course, possess the keeping qualities of the plain dry curd, but the retailer and consumer have become sufficiently familiar with the perishable character of creamed cottage cheese so that this product, with reasonable care, can be successfully marketed.

Often the person contemplating the manufacture of cottage cheese is thinking only in terms of getting some return for skimmilk which was formerly a total loss. This is approaching the cottage cheese business from the wrong angle. If a superior cottage cheese can be manufactured and marketed in an efficient manner, adequate returns for skimmilk will be sure to follow. Many manufacturers of cottage cheese hesitate to put a large quantity of expensive, fine flavored sweet cream upon the cottage cheese curd, and it is admitted that in the case of much of the cottage cheese curd now being made, the result would be to spoil good cream. But such cottage cheese is only a source of embarrassment and loss and is probably not worth making at all. A fine cottage cheese is well worth the addition of the sweet cream necessary to make it highly pleasing to the consumer. The addition of cream is not as expensive as would seem at first thought. A 15 percent cream is sufficiently rich and is used at the rate of  $\frac{1}{4}$  to  $\frac{1}{3}$  of the weight of curd (see fig. 9). This cream will be largely absorbed by the cheese leaving only enough free cream to give a pleasing rich appearance. The absorbed cream will cause the curd to have a smooth, pleasing rich flavor. Good

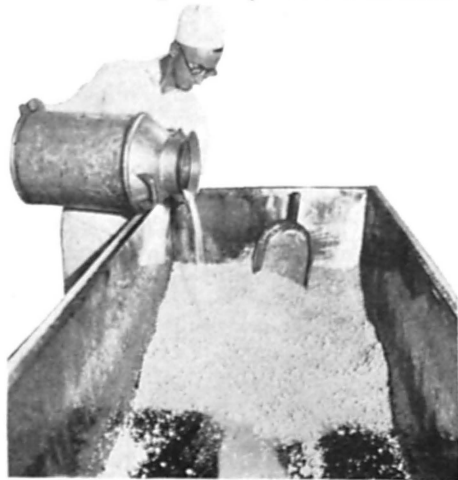


Fig. 9. The addition of  $\frac{1}{4}$  to  $\frac{1}{3}$  cream results in a highly pleasing product.





Fig. 10. The cheese is packaged in 12-ounce single service containers.

cottage cheese frequently sells for 12 cents per pound in bulk. Since each pound of cream produces an additional pound of cheese, a 15 percent cream is being sold in cottage cheese at 80 cents per pound of fat which is much more than can usually be obtained for it for other manufacturing purposes.

Another method of creaming is to add only about 10 percent of a fairly heavy cream. This makes a very smooth, fine flavored product with somewhat better keeping qualities, but as the cream is not visible, being largely absorbed, the consumer often does not seem to like the product as well as the larger quantity of lower testing cream and the cost of such a product is somewhat greater.

### YIELD OF CHEESE

Recent records in the college laboratory show that a total of 122,006 pounds of skimmilk yielded 18,884 pounds of curd, or 15.47 pounds of dry curd per 100 pounds of skimmilk. This was on the basis of actual yield of packaged dry cheese. Yield of creamed cheese is increased in proportion to amount of cream added.

The yield of uncreamed curd from each 100 pounds of skimmilk from approximately 3.5 percent milk will usually be 15 to 16 pounds. Somewhat higher or lower yields are often obtained but are due to abnormal fermentations or defects in the manufacturing process. For instance, if the curd is allowed to become too firm and acid, the yield will usually be high but the cheese will be wet and grainy. Uniform yields are good evidence of care and success in the manufacturing process. The yield is not the all important factor in cottage cheese manufacture, since the raw material, skimmilk, is relatively inexpensive. It is much more important that a fine texture and flavor be secured. The final yield of cheese will be the sum of the curd, salt and cream.

### PACKAGING

The single service fiber container has proved highly satisfactory as a retail package for cottage cheese (see fig. 10). This package has many advantages. It is neat, attractive, sanitary and carries advertising well.

The consumer readily identifies and becomes familiar with the brand, a fact which is very important in marketing a high quality cottage cheese. The cost of suitable cartons will run from \$15 to \$30 per 1,000, depending upon the size and quality of carton desired. The 12-ounce container seems to be the more satisfactory size for the average trade and a good grade of this container can be purchased for \$20 to \$25 per 1,000. Cheese in a 16-ounce package is more likely to become too old before it is all used. The 8-ounce package is also used. The 12-ounce, wide mouthed glass jar has been found by some milk companies to meet their needs well. Its cost is about the same as a milk bottle and it is washed and returned in the same way. Caps can be attractively printed. If the return of the bottle can be secured it is less expensive under many conditions than a fiber package. Bulk delivery of cottage cheese to retailers in crocks or other containers from which the cheese is weighed out in quantities desired by the customer has been popular because the loss in the case of old cheese does not also involve the loss of the value of the carton. Also the condition of the cheese at the time it is delivered to the buyer can be readily determined. Each manufacturer will need to consider his method of marketing and the demands of his trade in order to choose the best method of packaging for his business (see fig. 11). The 12-ounce single service container, attractively printed, should, however, be given serious consideration.

Often there is a demand for bulk cheese from someone who does not wish to manufacture his own cottage cheese, but still desires to sell under his own brand or from bulk. A very satisfactory way to supply such cheese is as dry curd in 60-pound butter tubs or 10-gallon milk cans. The dry curd will keep much better than if creamed. Curd should not be shipped at once, but placed in the refrigerator at least over night before shipment.

### USE OF RENNET

The use of rennet in cottage cheese has met with considerable favor in producing a large flake cottage cheese. Unless properly



Fig. 11. Several types of packages are available for cottage cheese.

used, toughness and whey leakage are likely to be troublesome. With pasteurization at 145° F. for 30 minutes, no difficulty should be experienced in obtaining a large flaky curd without rennet, but when temperature of 155° F. or above are used the curd formed with acid alone tends to break up finely when stirred and rennet will likely assist in retaining the desired coarse flaky condition. A setting temperature of 80° F. with 2 percent culture and 0.75 cc. of rennet per 1,000 lbs. of skimmilk has given satisfactory results. The cheese should be well cooled and held cold until used to prevent whey leakage.

### COST OF MANUFACTURE

The cost of cottage cheese will vary greatly under different plant conditions. The figures given below represent the major items of expense in the manufacture of the cheese in the college laboratory. The amount of skimmilk manufactured in each batch will vary from 1,000 to 1,500 pounds. The labor cost will decrease considerably as the amount of cottage cheese manufactured increases. The pasteurized skimmilk cost 40 cents per 100 pounds. The sweet cream used cost 10 cents over the sweet cream price, or about 13 cents over New York extras. The cartons used cost \$23.10 per 1,000 freight paid.

On the basis of 1,000 pounds of skimmilk the following costs are obtained:

1,000	pounds skimmilk at 40 cents.....	\$ 4.00
40	pounds 15 percent cream at 45 cents.....	2.70
266	$\frac{3}{4}$ -pound cartons at \$23.13.....	6.16
7	hours labor at 40 cents.....	2.80
		<hr/>
		\$15.66

Dividing the total cost by 266 packages gives \$.0588 as the manufacturing cost exclusive of overhead.

The overhead is as follows:

Interest and depreciation on vat and small equipment:	
Total cost, \$211.75	
Depreciation (at 16 2/3 percent annually) -----	\$35.29
Interest at 6 percent -----	12.70
	<hr/>
	\$47.99
Interest and depreciation cost per week -----	.92

The cost of water averaged \$0.43 per week on a three months' period. The cost of steam is estimated at \$1.00 per week. During this period when an average of 558 pounds per week was manufactured the cost per pound of cheese for the overhead items mentioned above was .42 cents or .32 cents per 12-ounce package. Other incidental expenses, including salt, washing powder, brushes, etc., would not raise this figure above .50 cents. The total cost of manufacturing under the conditions noted above would be 6.20 cents per 12-ounce package. By substituting his own costs in above calculations each manufacturer can easily adjust these figures to his own conditions.

## MARKETING

Assuming that the quality of the cottage cheese is fine when manufactured, the problem of marketing is to secure profitable outlets thru which it will reach the customer with this fine quality unimpaired. Milk companies which deliver the cheese with milk and cream undoubtedly have the best control over the quality of the cheese as received by the customer. This method of marketing, where applicable, is fine, but a large proportion of the cottage cheese sold reaches the consumer thru other channels. Meat markets generally have very good facilities for handling cottage cheese and since they are accustomed to caring for perishable meats, they are generally successful with cottage cheese.

The larger grocery stores often take excellent care of cottage cheese and comprise one of the best outlets. Outlets equipped with suitable refrigeration and a large discriminating trade are greatly to be preferred since these conditions favor the product reaching the consumer in the best possible condition.

It is always necessary to aid the retailer with advice and help if the cheese is to reach the customer in good condition. There is nothing which will more quickly destroy a good cottage cheese trade than for too old cheese to reach the consumer. At times it will probably be necessary to take back cheese which has become too old in the hands of the retailer. Only with care can such returns be kept at a minimum. Creamed cottage cheese usually spoils thru souring, while the dry curd often molds. Creamed cheese will keep in good condition two or three days in the average meat market or store. It should be kept in the dairy plant refrigerator until thoroly cooled.

The retail price for cottage cheese is 15 to 20 cents per  $\frac{3}{4}$ -pound carton. Bulk cheese is often sold at 15 to 25 cents per pound. Contrary to the opinion of many, the market demand for cottage cheese seems to be fairly uniform when once the outlets have become established and the trade familiar with the quality of the product. For a period of nine months the monthly demand for the college cheese fell below the average only by 17.5 percent and increased over the average only 35.3 percent. Our records show a somewhat greater consumption during the Lenten season and in the early summer. Frequently it is difficult to obtain sufficient skimmilk for cottage cheese in the fall and early winter. It is possible to store cottage cheese for some months by freezing. When thawed out, the cheese is inferior in flavor and texture to the fresh cheese, but many milk companies find it a solution to the fall shortage problem. Skimmilk powder also has been suggested as a possible solution of temporary milk shortages. The manufacture of cottage cheese from skimmilk powder by the process outlined in this publication has not proved entirely satisfactory. Difficulties in securing a good solution were experienced with roller process powder, the curd was very weak and after cooking it was inclined to be rubbery, with a pronounced heated

flavor. The spray process powder produced a satisfactory solution, but the curd did not have the firm smooth texture desired. The curd was inclined to be too fine and to retain too much moisture. When half normal skimmilk and half of a skimmilk powder solution was used, the results were somewhat better. The curd produced from spray process skimmilk powder would probably be salable, but is not high quality cheese curd. A yield of 14.16 pounds per 100 was obtained from skimmilk powder and water made up to the average milk solids concentration of normal skimmilk. This would be 1.57 pounds of cottage cheese from each pound of skimmilk powder. Probably cold storage of cottage cheese curd would be both less expensive and more satisfactory from the standpoint of type of cheese produced, than the use of skimmilk powder for meeting temporary shortages.

### **Food Value**

Much of the success in marketing cottage cheese in profitable quantities depends upon keeping its possibilities as a food before the consumer. Manufacturers will do well to include information about the food value of cottage cheese, its place in the diet, suggestions for its use, and good tested recipes in advertising literature. Especially is this appreciated by the housewife during the Lenten season and the warm months of summer. Such information and recipes can be secured from the Home Economics Division, Iowa State College, Ames; the United States Dept. of Agriculture, Washington, D. C.; the National Dairy Council, as well as from many other sources.